INTERIM RECOVERY PLAN NO. 309

# *Hibbertia abyssa*

# INTERIM RECOVERY PLAN

# 2011-2015

January 2011
Department of Environment and Conservation
Kensington

GOVERNMENT OF WESTERN AUSTRALIA

Government of **Western Australia**
Department of **Environment and Conservation**

# FOREWORD

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Conservation and Land Management (CALM) Policy Statements Nos. 44 and 50. Note: the Department of CALM formally became the Department of Environment and Conservation (DEC) in July 2006. DEC will continue to adhere to these Policy Statements until they are revised and reissued.

IRPs outline the recovery actions that are required to urgently address those threatening processes most affecting the ongoing survival of threatened taxa or ecological communities, and begin the recovery process.

DEC is committed to ensuring that Threatened taxa are conserved through the preparation and implementation of Recovery Plans (RPs) or IRPs, and by ensuring that conservation action commences as soon as possible and, in the case of Critically Endangered taxa, always within one year of endorsement of that rank by the Minister.

This IRP, which was prepared using Specific Nature Conservation Project funding, will operate from February 2011 to January 2016 but will remain in force until withdrawn or replaced. It is intended that, if the taxon is still ranked as Critically Endangered, this IRP will be reviewed after five years and the need for further recovery actions assessed.

This IRP was given regional approval in December 2010 and was approved by the Director of Nature Conservation on 7 February 2011. The provision of funds identified in this IRP is dependent on budgetary and other constraints affecting DEC, as well as the need to address other priorities.

Information in this IRP was accurate at January 2011.

## IRP PREPARATION

This IRP was prepared by Robyn Luu[1], Damien Rathbone[2], Sarah Barrett[3] and Andrew Brown[4].

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## ACKNOWLEDGMENTS

The following people provided assistance and advice in the preparation of this IRP:

| | |
|---|---|
| Chris Bishop | Environmental Officer, DEC Environmental Management Branch |
| Anne Cochrane | Senior Research Scientist, Threatened Flora Seed Centre, DEC Science Division |
| Andrew Crawford | Threatened Flora Seed Centre, DEC Science Division |
| Monica Hunter | Ecologist, DEC Species and Communities Branch |
| Amanda Shade | Assistant Curator (Nursery), Botanic Gardens and Parks Authority |
| Stephen Kern | Project Coordinator- Ravensthorpe Regional Flora Survey 2010, DEC Albany District |

Thanks also to the staff of the W.A. Herbarium for providing access to Herbarium databases and specimen information, and DEC Species and Communities Branch for assistance.

Cover photograph by Damien Rathbone.

## CITATION

This IRP should be cited as:

Department of Environment and Conservation (2011) *Hibbertia abyssa* Interim Recovery Plan 2011-2016. Interim Recovery Plan No. 309. Department of Environment and Conservation, Western Australia.

**SUMMARY**

| | | | |
|---|---|---|---|
| **Scientific Name:** | ***Hibbertia abyssa*** | **Common Name:** | |
| **Family:** | Dilleniaceae | **Flowering Period:** | October-February |
| **DEC Region:** | South Coast | **DEC District:** | Albany |
| **Shire:** | Ravensthorpe | **NRM Region:** | South Coast |
| **Recovery Team:** | Albany District Threatened Flora Recovery Team (ADTFRT) | | |

**Illustrations and/or further information:** Wege, J.A. and Thiele, K.R. (2009) Two new species of *Hibbertia* (Dilleniaceae) from near Ravensthorpe in Western Australia. *Nuytsia* 19 (2): 303-310; Western Australian Herbarium (1998−) *FloraBase − The Western Australian Flora*. Department of Environment and Conservation. http://florabase.dec.wa.gov.au/.

**Current status**: *Hibbertia abyssa* was declared as Rare Flora (DRF) under the Western Australian *Wildlife Conservation Act 1950* in February 2010. It is currently ranked as Critically Endangered under World Conservation Union (IUCN 2001) criteria B1ab(iii)+2ab(iii) due to its extent of occurrence being less than 100 $km^2$; area of occupancy less than 10 $km^2$; its populations being severely fragmented; and there being a continuing decline in the area, extent and quality of its habitat. The species is not currently listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999). The main threats to the species are mining and associated exploration activities, insecure land tenure, inappropriate fire regimes and disease.

**Description:** *Hibbertia abyssa* is an erect shrub up to 1.2 m high with sprawling lower stems. The young branchlets are distinctly ribbed from the base of each petiole with dense hairs between the glabrous ribs. The leaves are spirally arranged, crowded, ascending when young and spreading to the stem. The flowers are solitary in the axils, peduncles are ascending, straight or sigmoidally curved. There are five petals which are yellow and obovate.

**Habitat requirements:** *Hibbertia abyssa* is a narrow range endemic, known only from Bandalup Hill, 40 km southeast of Ravensthorpe. The species is restricted to a very distinctive geological substrate consisting of Pallinup Siltstone and silica caprock over ultramafic rock. It occurs on rocky outcrops in shallow red-brown light clay with surface siltstone fragments in *Eucalyptus-Banksia-Melaleuca* open mallee shrublands (Wege and Thiele 2009).

**Habitat critical to the survival of the species, and important populations:** Given that *Hibbertia abyssa* is ranked as Critically Endangered, it is considered that all known habitat for wild populations is critical to the survival of the species, and that all wild populations are important populations. Habitat critical to the survival of *H. abyssa* includes the area of occupancy of populations, areas of similar habitat surrounding and linking populations (these providing potential habitat for population expansion and for pollinators), additional occurrences of similar habitat that may contain undiscovered populations of the species or be suitable for future translocations, and the local catchment for the surface and/or groundwater that maintains the habitat of the species.

**Benefits to other species or ecological communities:** Recovery actions implemented to improve the quality or security of the habitat of *Hibbertia abyssa* will also improve the status of associated native vegetation, including three Declared Rare flora species, thirteen Priority flora species and two Priority 1 Ecological Communities.

**International obligations:** Although this plan is fully consistent with the aims and recommendations of the Convention on Biological Diversity, ratified by Australia in June 1993, and will assist in implementing Australia's responsibilities under that convention, *Hibbertia abyssa* is not listed under any specific international treaty and this IRP does not affect Australia's obligations under any other international agreements.

**Indigenous Consultation:** A search of the Department of Indigenous Affairs Aboriginal Heritage Sites Register has identified no sites of Aboriginal significance within the vicinity of *Hibbertia abyssa*. Input and involvement is being sought through the South West Aboriginal Land and Sea Council (SWALSC) and Department of Indigenous Affairs to determine if there are any issues or interests. As this is not expected to be completed before the approval of the IRP, consultation has been included as a recovery action to ensure there has been Indigenous engagement in relation to the recovery actions posed in this plan.

**Social and economic impacts:** The implementation of this recovery plan may cause some economic impact as all *Hibbertia abyssa* populations occur on Unallocated Crown Land (UCL) subject to a mineral exploration lease. Although mining has recently been suspended there is potential for economic impact should operations recommence. Recovery actions refer to continued liaison between relevant stakeholders.

**Affected interests:** The implementation of this plan may have implications for land managers, particularly where populations occur on lands not specifically managed for conservation. The occurrence of *Hibbertia abyssa* populations

on UCL subject to a mineral exploration lease will have implications for Department of Planning and the mining tenement holders. Recovery actions refer to continued liaison between affected stakeholders.

**Evaluation of the Plans Performance:** The DEC in conjunction with the Albany District Threatened Flora Recovery Team (ADTFRT) will evaluate the performance of this IRP. In addition to annual reporting on progress and evaluation against the criteria for success and failure, the plan will be reviewed following four years of implementation.

**Existing Recovery Actions**: The following recovery actions have been or are currently being implemented:

1. Surveys for *Hibbertia abyssa* have been undertaken in the Ravensthorpe Range and surrounding areas: See M. Fitzgerald 2007; D. Rathbone 2008/09 (as part of Ravensthorpe Regional Flora Survey funded by BHP Billiton); Craig *et al*. 2007; Kern *et al*. 2008.
2. A booklet on the significant flora of the Ravensthorpe Range, including pictures and descriptions for each species, is currently being compiled.
3. Liaison between DEC, BHP Billiton and First Quantum Minerals has been ongoing.
4. The ADTFRT are overseeing the implementation of this IRP and will include information on progress in their annual report to DEC Corporate Executive and funding bodies.

**IRP Objective**: The objective of this IRP is to abate identified threats and maintain or enhance *in situ* populations to ensure the long-term preservation of the species in the wild.

**Recovery Criteria**

**Criteria for success:** The number of populations have increased and/or the number of mature individuals have increased by 33% or more over the term of the plan.
**Criteria for failure:** The number of populations have decreased and/or the number of mature individuals have decreased by 33% or more over the term of the plan.

**Recovery actions**

1. Coordinate recovery actions
2. Collect seed and cuttings
3. Monitor populations
4. Formally notify land owners and land managers
5. Nominate *Hibbertia abyssa* for listing under the Commonwealth EPBC Act
6. Achieve long term protection of habitat
7. Conduct further surveys
8. Develop and implement a fire management strategy
9. Obtain biological and ecological information
10. Liaise with relevant land managers and Indigenous groups
11. Promote awareness
12. Map habitat critical to the survival of *Hibbertia abyssa*
13. Review the IRP and assess the need for further recovery actions

# 1. BACKGROUND

## History

*Hibbertia abyssa* was first collected by Gil Craig in 1998 during a survey for the Ravensthorpe Nickel Project and was identified as *H*. aff. *mucronata* by Judy Wheeler. The taxon was recollected in 2007 as part of the *Floristic Survey of the Ravensthorpe Range* (Kern *et al.* 2007). DEC botanist Juliet Wege undertook a taxonomic evaluation and considered it to be morphologically distinct from *H. mucronata*. The species was provided with a phrase name *Hibbertia* sp. Bandalup Hill in January 2008.

*Hibbertia abyssa* is known from two locations in the Ravensthorpe region, one of which is adjacent to the former BHP Billiton nickel mine and the other to the west. In 2008, as part of the mine expansion, one occurrence of *H. abyssa* was removed from the upper slopes of Bandalup Hill. The exact number of plants lost was not able to be accurately estimated due to the extent of the population prior to mining being unknown. While nickel mining operations have been suspended, the mine may reopen in the future and a reduction in plant numbers is predicted if this occurs. The species is currently known from three extant and one extinct population containing an estimated 163,139 mature individuals.

## Description

*Hibbertia abyssa* is an erect shrub to 1.2m high with sprawling lower stems. The young branchlets are distinctly ribbed from the base of each petiole with dense hairs between the glabrous ribs. The leaves are spirally arranged, crowded, ascending when young and spreading to the stem. The flowers are solitary in the axils, peduncles are ascending, straight or sigmoidally curved. There are five petals which are yellow and obovate. *H. abyssa* is named after the Latin *abyssus* meaning an abyss or bottomless pit, and refers to its position at the edge of a mine pit and also at the edge of extinction (Wege and Thiele 2009).

*Hibbertia abyssa* is distinguished from related taxa by its long, slender and more or less glabrous peduncles. The combination of uncinate and stellate hairs on the outer sepals suggest an affinity to *H. hamulosa*. This species differs from *H. abyssa* in its densely stellate-hairy rather than glabrous stem ribs, short and densely stellate-hairy peduncles, and mature leaves (Wege and Thiele 2009).

## Distribution and habitat

*Hibbertia abyssa* is a narrow range endemic, known from three extant, and one extinct population near Bandalup Hill, 40 km southeast of Ravensthorpe. Habitat descriptions for the populations are as follows:

- Populations 1 and 2: The locations near the minesite (Population 1 now cleared) are restricted to a distinctive geological substrate consisting of Pallinup Siltstone and silica caprock over ultramafic rock. The populations occur in shallow red-brown light clay in *Eucalyptus-Banksia-Melaleuca* open mallee shrublands (Wege and Thiele 2009);
- Population 3: sandstone/siltstone, rocky terrain and saprolite breakaway
- Population 4: mallee woodland, over orange/brown sandy clay, over silcrete rock

Dominant associated taxa include *Eucalyptus lehmannii* subsp. *parallela*, *E. pleurocarpa*, *Banksia lemanniana*, *Melaleuca pentagona* var. *latifolia*, *Beaufortia orbifolia*, *Rhadinothamnus rudis*, *Hovea acanthoclada*, *Calothamnus quadrifidus*, *Beyeria brevifolia* and *Schoenus sublaxus*.

**Table 1. Summary of population land vesting, purpose and manager**

| Pop. No. & Location | DEC District | Shire | Vesting | Purpose | Manager |
|---|---|---|---|---|---|
| **1. ESE Ravensthorpe** | Albany | Ravensthorpe | Non vested | Unallocated Crown Land | First Quantum |
| **2. ESE Ravensthorpe** | Albany | Ravensthorpe | Non vested | Unallocated Crown Land | First Quantum |
| **3a. ESE Ravensthorpe** | Albany | Ravensthorpe | Non vested | Unallocated Crown Land | First Quantum |
| **3b. ESE Ravensthorpe** | Albany | Ravensthorpe | Non vested | Unallocated Crown Land | First Quantum |
| **3c. ESE Ravensthorpe** | Albany | Ravensthorpe | Shire of Ravensthorpe | Road Reserve (closed) | First Quantum, Shire of Ravensthorpe |
| **4. ESE Ravensthorpe** | Albany | Ravensthorpe | Non vested | Unallocated Crown Land | First Quantum |

Populations in **bold text** are considered to be important populations.

## Biology and ecology

Regeneration of *Hibbertia abyssa* was observed at Population 4 following a fire in 2003, probably through germination of soil-stored seed.

## Threats

*Hibbertia abyssa* was declared as Rare Flora (DRF) under the Western Australian *Wildlife Conservation Act 1950* in February 2010. It is currently ranked as Critically Endangered under World Conservation Union (IUCN 2001) criteria B1ab(iii)+2ab(iii) due to its extent of occurrence being less than 100 $km^2$; its area of occupancy being less than 10 $km^2$; populations being severely fragmented; and there being a continuing decline in the area, extent and quality of its habitat. The species is not currently listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999). The main threats to the species are mining and associated exploration activities, insecure land tenure, inappropriate fire regimes and disease.

- **Mining and associated exploration activities** are a threat to *Hibbertia abyssa*. The species is confined to Bandalup Hill which has been severely impacted by nickel mining (74/114, 74/448). Direct impacts associated with mining include clearing of vegetation, development of overburden storage facilities and topsoil stockpiles. Indirect impacts include interruptions to surface drainage and ponding of surface water, edge effects from changes to hydrology and soil moisture regimes and dust impacts. Monitoring (as per Management Plan developed for the mining operations) to assess the impact of hydrological changes to conservation areas will include quarterly assessment of vegetation condition, use of high resolution multispectral imagery to gauge vegetation condition and direct monitoring of soil-moisture-status using theta-probes (BHP Billiton 2006).
- **Insecure land tenure.** All populations are found on land tenure that is not for the purpose of conservation.
- **Inappropriate fire regimes** may be a threat to all populations of *Hibbertia abyssa*. The species regenerates after fire through germination of soil-stored seed, however the timing of fire may impact on recruitment. Fire may also facilitate weed invasion and should be followed up with appropriate weed control.
- **Disease**: The susceptibility of *Hibbertia abyssa* to *Phytophthora cinnamomi* is unknown although other members of the genus can be susceptible. While Bandalup Hill is currently considered dieback-free, mining activities may introduce the pathogen to the site. Infestations are present to the south of the hill on Mason Bay Rd.

The intent of this plan is to provide actions that will deal with immediate threats to *Hibbertia abyssa*. Although climate change may have a long-term effect on the species, actions taken directly to prevent the impact of climate change are beyond the scope of this plan.

**Table 2. Summary of population information and threats**

| Pop. No. & Location | Land Status | Year / No. of plants | Current Condition | Threats |
|---|---|---|---|---|
| 1. ESE Ravensthorpe | Unallocated Crown Land | 1998 *~1000-5000<br>2008 0 | Cleared | |
| 2. ESE Ravensthorpe | Unallocated Crown Land | 1998 *~1000-5000<br>2010 137,219 | Partially cleared, remaining plants healthy | Mining, insecure land tenure, inappropriate fire regimes, disease |
| 3a. ESE Ravensthorpe | Unallocated Crown Land | 2010 19,805 | Healthy | Mining, insecure land tenure, inappropriate fire regimes, disease |
| 3b. ESE Ravensthorpe | Unallocated Crown Land | 2010 995 | Healthy | Mining, insecure land tenure, inappropriate fire regimes, disease |
| 3c. ESE Ravensthorpe | Shire Road Reserve | 2009 120 | Healthy | Mining, insecure land tenure, inappropriate fire regimes, disease |
| 4. ESE Ravensthorpe | Unallocated Crown Land | 2009 ~13,500 | Healthy | Mining, insecure land tenure, inappropriate fire regimes, disease |

Note: * = total for populations 1 and 2 combined, numbers were not accurately estimated

## Guide for decision-makers

Section 1 provides details of current and possible future threats. Development and/or land clearing in the immediate vicinity of *Hibbertia abyssa* will require assessment. On-ground works should not be approved unless the proponents can demonstrate that their actions will not have any significant negative impact on the species, its habitat or potential habitat or on the local surface hydrology, such that drainage in the habitat of the species would be altered.

## Habitat critical to the survival of the species, and important populations

Given that *Hibbertia abyssa* is ranked as Critically Endangered, it is considered that all known habitat for wild populations is critical to the survival of the species, and that all wild populations are important populations. Habitat critical to the survival of *H. abyssa* includes the area of occupancy of populations, areas of similar habitat surrounding and linking populations (these providing potential habitat for population expansion and for pollinators), additional occurrences of similar habitat that may contain undiscovered populations of the species or be suitable for future translocations, and the local catchment for the surface and/or groundwater that maintains the habitat of the species.

## Benefits to other species or ecological communities

Recovery actions implemented to improve the quality or security of the habitat of *Hibbertia abyssa* will also improve the status of associated native vegetation. Three DRF and 12 Priority flora occur in the vicinity of *H. abyssa*. These taxa are listed in the table below:

**Table 3. Conservation–listed flora species occurring in vicinity of *Hibbertia abyssa***

| Species name | Conservation Status (WA) | Conservation Status (EPBC Act 1999) |
|---|---|---|
| *Kunzea similis* subsp. *mediterranea* | DRF (Endangered) | – |
| *Beyeria cockertonii* | DRF (Vulnerable) | – |
| *Eucalyptus purpurata* | DRF (Vulnerable) | – |
| *Acrotriche orbicularis* | Priority 1 (nominated DRF) | |
| *Spyridium* sp. Jerdacuttup | Priority 2 | – |
| *Astroloma microphyllum* | Priority 3 | – |
| *Gyrostemon sessilis* | Priority 3 | – |
| *Lepidosperma gahnioides* | Priority 3 | – |
| *Microcybe pauciflora* subsp. *grandis* | Priority 3 | – |
| *Allocasuarina hystricosa* | Priority 4 | – |
| *Dampiera deltoidea* | Priority 4 | – |
| *Eucalyptus stoatei* | Priority 4 | – |
| *Goodenia phillipsiae* | Priority 4 | – |
| *Pultenaea calycina* subsp. *proxena* | Priority 4 | – |
| *Stachystemon vinosus* | Priority 4 | – |

For a description of the Priority categories see Atkins (2008).

*Hibbertia abyssa* also occurs within one kilometre of two Priority Ecological Communities (PECs).

**Table 4. Priority Ecological Community (PEC) in which *Hibbertia abyssa* occurs or is adjacent to**

| PEC Title | Conservation Status (WA) | Conservation Status (EPBC Act 1999) |
|---|---|---|
| Heath on Komatiite at Bandalup Hill | Priority 1 | – |
| *Eucalyptus purpurata* woodlands (Bandalup Hill) | Priority 1 | – |

For a description of the TEC and PEC categories see DEC (2007).

## International obligations

Although this plan is fully consistent with the aims and recommendations of the Convention on Biological Diversity, ratified by Australia in June 1993, and will assist in implementing Australia's responsibilities under that convention, *Hibbertia abyssa* is not listed under any specific international treaty and this Interim Recovery Plan (IRP) does not affect Australia's obligations under any other international agreements.

## Indigenous Consultation

A search of the Department of Indigenous Affairs Aboriginal Heritage Sites Register has identified no sites of Aboriginal significance within the vicinity of populations of *Hibbertia abyssa*. However, input and involvement is being sought through the South West Aboriginal Land and Sea Council (SWALSC) and Department of Indigenous Affairs to determine if there are any issues or interests. As this is not expected to be completed before the approval of the IRP, further consultation has been included as a recovery action to ensure there has been Indigenous engagement in relation to the recovery actions posed in this plan.

## Social and economic impacts

The implementation of this recovery plan may cause some economic impact as all *Hibbertia abyssa* populations occur on Unallocated Crown Land (UCL) subject to a mineral exploration lease. Although mining has recently been suspended there is potential for economic impact should operations recommence. Recovery actions refer to continued liaison between relevant stakeholders.

## Affected interests

The implementation of this plan may have implications for land managers, particularly where populations occur on lands not specifically managed for conservation. The occurrence of *Hibbertia abyssa* populations on UCL subject to a mineral exploration lease will have implications for Department of Planning and the mining tenement holders. Recovery actions refer to continued liaison between affected stakeholders.

## Evaluation of the Plans Performance

DEC, in conjunction with the Albany District Threatened Flora Recovery Team (ADTFRT), will evaluate the performance of this IRP. In addition to annual reporting on progress and evaluation against the criteria for success and failure, the plan will be reviewed following five years of implementation.

## 2. RECOVERY OBJECTIVE AND CRITERIA

### Objective

The objective of this IRP is to abate identified threats and maintain or enhance *in situ* populations to ensure the long-term preservation of the species in the wild.

**Criteria for success:** The number of populations have increased and/or the number of mature individuals have increased by 33% or more over the term of the plan.
**Criteria for failure:** The number of populations have decreased and/or the number of mature individuals have decreased by 33% or more over the term of the plan.

## 3. RECOVERY ACTIONS

### Existing recovery actions

Surveys for *Hibbertia abyssa* have been undertaken in the Ravensthorpe Range and surrounding areas: M. Fitzgerald 2007; D. Rathbone 2008/09; S. Kern 2010 (as part of Ravensthorpe Regional Flora Survey funded by BHP Billiton); Craig *et al*. 2007; Kern *et al*. 2008.

A booklet on the significant flora of the Ravensthorpe Range, including pictures and a description, is currently being prepared.

Liaison between DEC and BHP Billiton was ongoing until December 2009, with DEC receiving a copy of the management plan for Priority Flora and Significant Vegetation Communities. Since First Quantum minerals acquired the project from BHP Billiton in December 2009, little liaison has occurred with DEC due to the project being placed in "care and maintenance". No further clearing has occurred or is currently proposed. It is unlikely that further formal contact will occur until the Annual Environmental Report is due in October 2010, or advice is received that the project is leaving "care and maintenance".

The ADTFRT are overseeing the implementation of this IRP and will include information on progress in their annual report to DEC Corporate Executive and funding bodies.

### Future recovery actions

Where recovery actions are to occur on lands other than those managed by DEC, permission has been or will be sought from appropriate owners/land managers prior to recovery actions being undertaken. The following recovery actions are generally in order of descending priority, influenced by their timing over the life of the plan. However this should not constrain addressing any of the actions if funding is available and other opportunities arise.

#### 1. Coordinate recovery actions

The ADTFRT will oversee the implementation of the recovery actions for *Hibbertia abyssa* and will include information on progress in their annual report to DEC Corporate Executive and funding bodies.

**Action:** Coordinate recovery actions
**Responsibility:** DEC (Albany District) through the ADTFRT
**Cost:** $6,000 per year

#### 2. Collect seed and cuttings

Seed collections are required from all populations of *Hibbertia abyssa* to ensure the genetic diversity of the species is captured. Cuttings will also be collected to establish a living collection of genetic material.

**Action:** Collect seed cuttings
**Responsibility:** DEC (Albany District, TFSC), Botanic Gardens and Parks Authority (BGPA) through the ADTFRT
**Cost:** $5,000 per year

### 3. Monitor populations

Monitoring disease, grazing, weed invasion, habitat degradation, hydrology, population stability (expansion or decline), pollinator activity, seed production, recruitment, and longevity is essential. Further quantification of populations numbers and survey of population boundaries is required.

**Action:** Monitor populations
**Responsibility:** DEC (Albany District), First Quantum through the ADTFRT
**Cost:** $7,000 per year

### 4. Formally notify land owners and land managers

As the species has recently been gazetted as Rare Flora, land owners and managers need to be formally notified of the presence of *Hibbertia abyssa*.

**Action:** Formally notify land owners and land managers
**Responsibility:** DEC (Species and Communities Branch (SCB))
**Cost:** $2,000 in first year

### 5. Nominate *Hibbertia abyssa* for listing under the Commonwealth EPBC Act

Staff from DEC SCB will develop a Species Profile and Threats (SPRAT) and/or nomination form for this species, and forward it to the Commonwealth Department of the Environment, Water, Heritage and the Arts for referral to the Threatened Species Scientific Committee (TSSC) for endorsement under the EPBC Act.

**Action:** Nominate *Hibbertia abyssa* for listing under the Commonwealth EPBC Act
**Responsibility:** DEC (SCB)
**Cost:** $3,000 in year 1

### 6. Achieve long term protection of habitat

The long term protection of habitat that contains populations of this species may be achieved through declaration as reserves for the conservation of flora and fauna.

**Action:** Achieve long term protection of habitat
**Responsibility:** DEC (Albany District, Land Acquisition Branch) through the ADTFRT
**Cost:** $3,000 per year

### 7. Conduct further surveys

Potential suitable habitat should be surveyed for the presence of *Hibbertia abyssa* during its flowering period. All surveyed areas will be recorded and the presence or absence of the species documented to increase survey efficiency and reduce unnecessary duplicate surveys. Where possible, volunteers from the local community, landcare groups, The Wildflower Society of WA (Inc) and naturalists clubs should be involved.

**Action:** Conduct further surveys
**Responsibility:** DEC (Albany District) through the ADTFRT
**Cost:** $5,000 in years 1, 3 and 5

### 8. Develop and implement a fire management strategy

Fire should be excluded from the habitat of populations, except where it is being used experimentally as a recovery tool. A fire management strategy will be developed that recommends fire frequency, intensity, season, and control measures.

**Action:** Develop and implement a fire management strategy
**Responsibility:** DEC (Albany District), First Quantum through the ADTFRT
**Cost:** $10,000 in first year and $2,000 in subsequent years

### 9. Obtain biological and ecological information

Knowledge of the biology and ecology of the species will provide a scientific basis for management of *Hibbertia abyssa* in the wild. Studies willl include:

1. Study of the soil seed bank dynamics and the role of various factors including disease, disturbance, competition, drought, inundation and grazing in recruitment and seedling survival.
2. Determination of reproductive strategies, phenology and seasonal growth.
3. Investigation of the mating system and pollination biology.
4. Investigation of population genetic structure, levels of genetic diversity and minimum viable population size.
5. The impact of changes in hydrology in the habitat.
6. Determine susceptibility of the taxon to *Phytophthora cinnamomi*.

**Action:** Obtain biological and ecological information
**Responsibility:** DEC (Science Division, Albany District) through the ADTFRT
**Cost:** $20,000 per year

### 10. Liaise with relevant land managers and Indigenous groups

Staff from DEC Albany District and Environmental Management Branch (EMB) will liaise with First Quantum Minerals to ensure that populations of *Hibbertia abyssa* are not accidentaly damaged or destroyed during mining operations and environmental conditions, including monitoring of impacts and flora, are adhered to. Indigenous consultation will take place to determine if there are any issues or interests in areas that are habitat for *H. abyssa*.

**Action:** Liaise with relevant land managers and Indigenous groups
**Responsibility:** DEC (Albany District, EMB) through the ADTFRT
**Cost:** $3,000 per year

### 11. Promote awareness

A booklet containing pictures and descriptions of significant flora of the Ravensthorpe Range is currently being compiled and once completed will be promoted to the public. The importance of biodiversity conservation and the need for the long-term protection of wild populations of *Hibbertia abyssa* will be promoted to the community through poster displays and the local print and electronic media. An information sheet that includes a description of the plant, its habitat type, threats and management actions, and photos will be produced. Formal links with local naturalist groups and interested individuals will also be encouraged.

**Action:** Promote awareness
**Responsibility:** DEC (Albany District, SCB, Strategic Development and Corporate Affairs Division) through the ADTFRT
**Cost:** $4,000 in year 1 and $2,000 in years 2-5

### 12. Map habitat critical to the survival of *Hibbertia abyssa*

It is a requirement of the EPBC Act 1999 that spatial data relating to habitat critical to the survival of threatened species be determined. Although habitat critical to the survival of *Hibbertia abyssa* is alluded to in Section 1, it has not yet been mapped and will be addressed under this action. If additional populations are located, then habitat critical to their survival will also be determined and mapped.

**Action:** Map habitat critical to the survival of *Hibbertia abyssa*
**Responsibility:** DEC (SCB, Albany District) through the ADTFRT
**Cost:** $6,000 in year 2

### 13. Review the IRP and assess the need for further recovery actions

If *Hibbertia abyssa* is still ranked as Critically Endangered at the end of the five-year term of this IRP, the need for further recovery actions, or a review of this IRP will be assessed and a revised plan prepared if necessary.

**Action:** Review this IRP and assess the need for further recovery actions
**Responsibility:** DEC (SCB, Albany District) through the ADTFRT
**Cost:** $3,000 in year 5

**Table 5. Summary of Recovery Actions**

| Recovery Action | Priority | Responsibility | Completion Date |
|---|---|---|---|
| Coordinate recovery actions | High | DEC (Albany District) through the ADTFRT | Ongoing |
| Collect seed seed and cuttings | High | DEC (Albany District, TFSC), BGPA through the ADTFRT | 2015 |
| Monitor populations | High | DEC (Albany District), First Quantum through the ADTFRT | Ongoing |
| Formally notify land owners and land managers | High | DEC (SCB) | 2011 |
| Nominate *Hibbertia abyssa* for listing under the Commonwealth EPBC Act | High | DEC (SCB) | 2011 |
| Achieve long term protection of habitat | High | DEC (Albany District, Land Acquisition Branch) through the ADTFRT | 2015 |
| Conduct further surveys | High | DEC (Albany District) through the ADTFRT | Ongoing |
| Develop and implement a fire management strategy | High | DEC (Albany District), First Quantum through the ADTFRT | Developed by 2011 with implementation ongoing |
| Obtain biological and ecological information | High | DEC (Science Division, Albany District) through the ADTFRT | 2015 |
| Liaise with relevant land managers and Indigenous groups | High | DEC (Albany District and EMB) through the ADTFRT | Ongoing |
| Promote awareness | Medium | DEC (Albany District, SCB, and Strategic Development and Corporate Affairs Division) through the ADTFRT | Ongoing |
| Map habitat critical to the survival of *Hibbertia abyssa* | High | DEC (SCB, Albany District) through the ADTFRT | 2012 |
| Review the IRP and assess the need for further recovery actions | Medium | DEC (SCB, Albany District) through the ADTFRT | 2015 |

## 4. TERM OF PLAN

This IRP will operate from January 2011 to December 2015 but will remain in force until withdrawn or replaced. If the species is still ranked Critically Endangered after five years, the need for further recovery actions will be determined.

## 5. REFERENCES

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## 6. TAXONOMIC DESCRIPTION

***Hibbertia abyssa***

Wege, J.A. and Thiele, K.R. (2009) Two new species of *Hibbertia* (Dilleniaceae) from near Ravensthorpe in Western Australia. *Nuytsia* 19 (2): 303-310.

Upright, single- or multi-stemmed *shrub* to 1.2 m high with sprawling lower stems; young branchlets distinctly ribbed from the base of each petiole, densely stellate-hairy between the ± glabrous ribs. *Leaves* spirally arranged, crowded, ascending when young, spreading to slightly more than 90˚ to the stem; petioles 0.5–1 mm long, with a dense indumentum of simple and/or stellate hairs on the adaxial surface and margin, glabrous abaxially; lamina linear to subulate, (4–)6–11(–14) mm long, 0.9–1.4(–1.6) mm wide, subterete, with the margin tightly recurved to a prominent, thickened midrib; upper surface with sparse tubercles, occasionally with very sparse, antrorse simple and/or stellate hairs; apex a strong, straight, pungent mucro. *Flowers* solitary in the axils; peduncles ascending, straight or sigmoidally curved, 6–14 mm long, glabrous or with sparse uncinate hairs distally; bract subtending the flower narrowly triangular, 1.5–2 mm long, acute to acuminate with ciliolate margins. *Sepals* 5, green with dark red markings, elliptic to narrowly ovate, 3.5–5 mm long; outer sepals with a short, indurate, pungent apex, outer surface with moderately dense uncinate hairs and sparse minute stellate hairs, inner surface with minute stellate hairs apically; inner sepals obtuse, outer surface with sparse uncinate and stellate hairs, the margins membraneous and glabrous, inner surface glabrous. *Petals* 5, yellow, obovate, 6–8.5 mm long, emarginate. Stamens 5, all on one side of the carpels, connate basally; filaments *c*. 0.5 mm long; anthers narrowly ovate to oblong, 2–2.2 mm long, dehiscing by

longitudinal slits; staminodes absent. *Carpels* 2, broadly ellipsoid, densely hairy; ovules 2 per carpel. *Fruiting carpels* not seen.